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Research Brief

Classification and Regression Tree Analysis of Individuals with ADHD

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Objective

The diagnosis and treatment of ADHD is complicated by the high comorbidity of ADHD with other disorders and subsequent similar patterns of performance on neuropsychological measures. For example, individuals with ADHD may demonstrate cognitive profiles similar to individuals with learning disabilities, traumatic brain injuries, and social-emotional problems. Identification and diagnosis of ADHD is further complicated by validity problems found with the diagnostic criteria found in the DSM-IV, and the association between the diagnosis of ADHD and actual impairment has also been less robust in some studies (Lashley & Applegate, 2001).

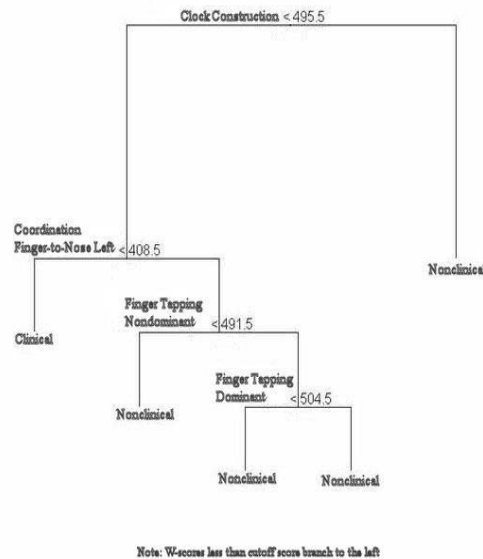
A recent trend in the literature has documented group differences between individuals with and without ADHD on neuropsychological tests. For example, the findings of Doyle, Beiderman, Seidman, Weber, and Faraone (2000) supported Voeller's (1990) hypothesis that ADHD is a developmental brain disorder with primary deficits in the frontal cortex and subcortical regions projecting to the fronta lobes. Additionally, Doyle et al. (2000) concluded that children with ADHD show various deficits on neuropsychological tests of attention. However, whether such tests discriminate individuals with ADHD from non-ADHD controls remains unclear (Doyle et al., 2000).

Exploring non-cognitively based assessments, such as the measurement of sensory-motor skills, will aid in forming differential diagnoses of ADHD and explore the effectiveness of neuropsychological tests in differentiating of groups of individuals with and without ADHD.

Data Selection

This study examined the sensory-motor performance of 118 individuals with ADHD (mean age = 12.4 years, standard deviation = 5.51 years) and 950 normal individuals (mean age = 29.7 years, standard deviation = 21.3 years). All participants were administered the *Dean-Woodcock Sensory Motor Battery* (DWSMB), a comprehensive measure of sensory and motor functioning (Dean, & Woodcock, 2003). Four tests from the DWSMB were identified as being useful in differentiating individuals with and without ADHD. The resubstitution rate in this study was 90%.

CART Results of Sensory and Motor Tasks



References

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Data Synthesis

Classification and Regression Tree Analysis (CART) uses a set of variables to separate subjects into groups, which can be used to aid in clinical judgment in forming differential diagnoses. CART also develops a hierarchical tree that separates the disparate groups. A 5-node decision tree was found to be the most parsimonious and statistically powerful. The primary separator variable was Clock Construction, with 94.9% of individuals with a W-score above 495.5 being classified as normal.

Coordination Finger-to-Nose Left was a secondary separation variable. Of individuals with a with a Clock Construction W-score less than 495.5, individuals with a Coordination Finger-to-Nose Left W-score less than 408.5 were differentiated into a predominantly clinical group. 78.6% of these individuals were correctly classified as having ADHD. Finger Tapping Nondominant was also successful in differentiating individuals with and without ADHD, with 93.7% of individuals with a W-score less than 491.9 being correctly classified as being non-clinical. However, Finger Tapping Dominant was not as successful at discriminating between individuals with and without ADHD for individuals who had a W-score less than 504.5. Only 66.9% of individuals with Finger Tapping Dominant W-scores below 504.5 were classified correctly as non-clinical, while 90.9% of individuals with a W-score greater than 504.5 were correctly classified in a non-clinical group.

Conclusions

Clock Construction was a very powerful separation variable for the groups of individuals with and without ADHD. Indeed, 94.9% of the individuals with a Clock Construction W-score above 495.5 were classified as normal. This indicates that Clock Construction is useful measure in differentiating between individuals with and without ADHD and can be used to aid clinicians in forming diagnoses for individuals with or without ADHD. Coordination Finger-to-Nose Left was also useful in differentiating individuals with and without ADHD, forming the only predominantly clinical group within the tree. Finger Tapping Dominant and Nondominant tasks were also useful in differentiating individuals with and without ADHD, with the exception of individuals with W-scores less than 504.5.

Caution must be used in the interpretation of the results due to uneven sample sizes. That is, the non-clinical sample was significantly larger than the clinical group, increasing the likelihood groups will be classified as predominantly nonclinical. Overall, however, the data suggest tests from the DWSMB included in the CART tree were useful in differentiating individuals with and without ADHD and are useful tools for aiding clinicians in forming differential diagnoses.